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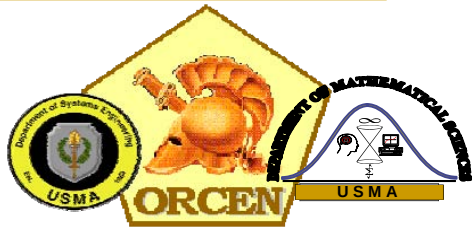
Finding the Right Terrain Database

MAJ Grant Martin
LTC Jeffrey Schamburg
LTC Michael J. Kwinn, Jr.
Presentation to the MORSS
23 June 2005

Operations Research Center of Excellence
Researching the Army's Future
Developing Tomorrow's Leaders

Outline



- Purpose
- Background
- Methodology
- Problem definition
- Design and Analysis
- Recommendation
- Questions and discussion

Purpose

To describe the methodology used to define the metadata for use in the Army Digital Terrain Library (ADTL)

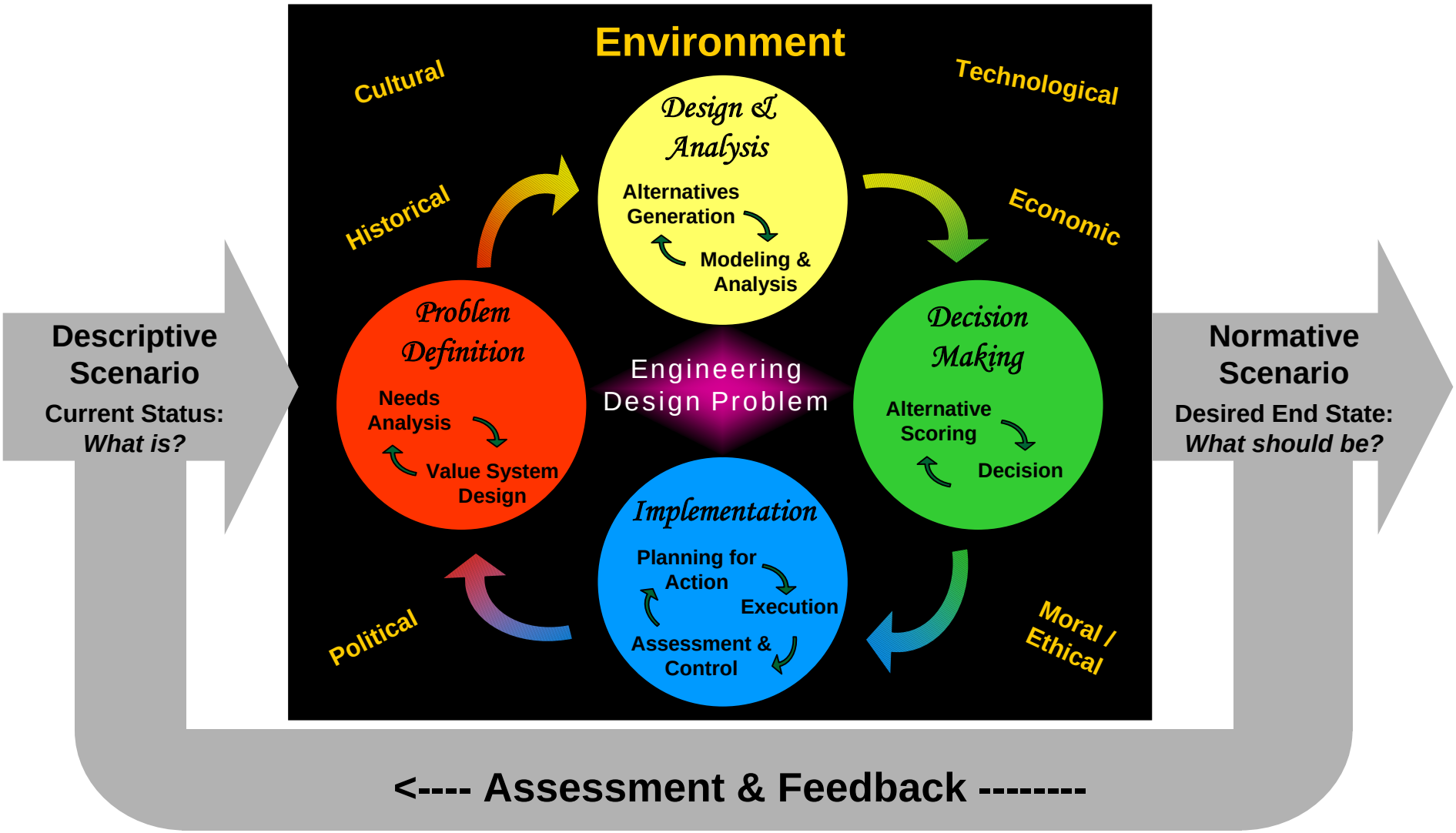
Background

Initiated by the Battle Command, Simulation and Experimentation Directorate (BCSE)

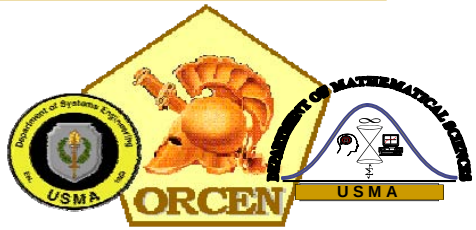
- Goal: a list of all modeling and simulation terrain databases (M&S TDBs)
- These databases would become the basis for the ADTL

ADTL will provide wide access to TDBs for users across the Army

General Approach: Systems Engineering and Management Process (SEMP)

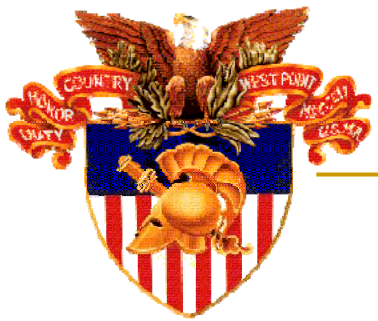


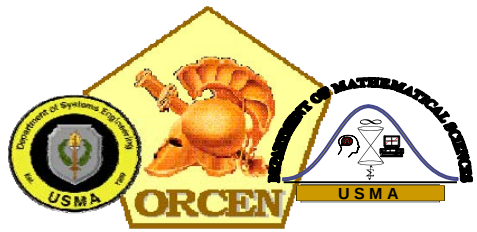
Major Activities



- Problem definition
  - Background research
  - Stakeholder input via telecons and questionnaire
  - Refine needed functions
- Data collection and analysis
  - Workshop
  - Questionnaire
  - Telecons

Problem Definition

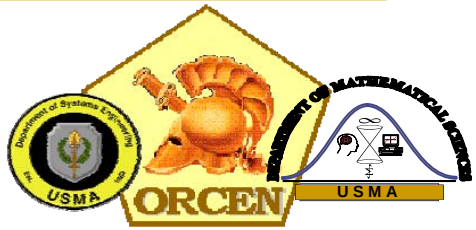




Initial Problem Statement

Compile a list of all modeling and simulation terrain databases

Stakeholder Analysis (1 of 2)



- UAMBL
- PEO STRI
- NSC
- ERDC TEC
- ERDC GSL
- MANSCEN
- MBBL
- TSM FCS
- TRAC-WSMR
- TRAC-MTRY
- TRADOC Futures Center
- Boeing
- TPIO-Terrain
- TPIO-Virtual
- TPIO-Battle Command
- Ft. Hood CTSF
- SBBL
- RDECOM
- FCS LSI / Tng. IPT
- HQ TRADOC
- Natick Soldier Center
- USMA G&EnE
- NGA
- UO FACT
- Northrup Grumman

Representatives from each of these received the questionnaires

Stakeholder Analysis (2 of 2)

Based on interviews, questionnaire

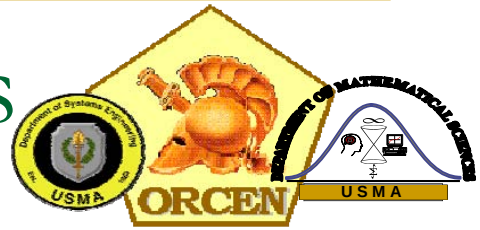
- Identified the needed functionality for a solution
- Identified the competing interests

  More fields → better search capability but harder to post

  Fewer fields → easier to post but less productive searches
- Allowed us to refine the needs of the community

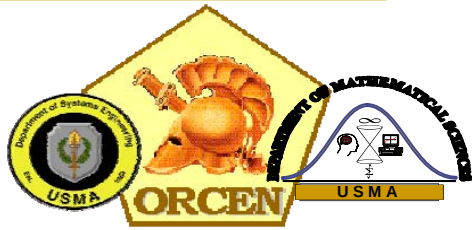
Defining the metadata correctly seems to be the key to increasing the potential for success of the ADTL

Related Systems and Activities



- Army Geospatial Data Integrated Master Plan (AGDIMP)
- Joint Geographic Enterprise System (J-GES) development
- Federal Geographic Data Committee Standards (FGDC)
- Synthetic Environment Data Representation and Interchange Specification (SEDRIS)
- Environmental Data Coding Specification (EDCS) (now ISO approved)
- Master Environmental Library (MEL)
- Features and Attribute Coding Catalog (FACC) development
- PEO-STRI Synthetic-Virtual Data Repository (SVDR)
- UO Focused Area Collaboration Team (FACT)
- GDI (Geospatial Data / Information) FACT

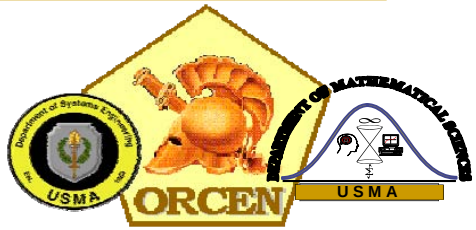
Functional Decomposition



Manage modeling and simulation terrain databases

- **Provide easy access / search capability (1st priority)**
- **Provide easy data entry / upload capability (2nd priority)**
- **Allow cross talk among users of TDBs (3rd priority)**

Value System

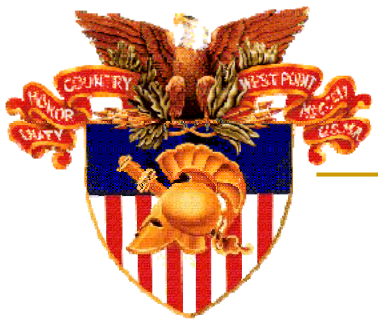


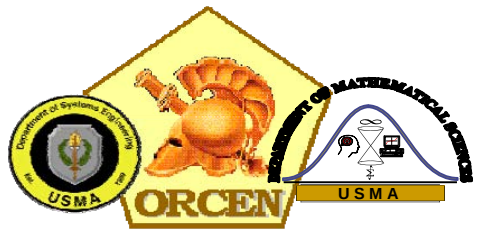
- TDB User-focused
- Competing interests for number of metadata fields
- Recommendation: metadata that is
  - Relatively short (few fields)
  - Widely-considered as useful (meaningful fields)
- Functionality should support users sharing information about TDBs

Revised Problem Statement

Determine the essential metadata and significant functions that allow for efficient retrieval and organization of modeling and simulation terrain databases

Modeling and Analysis





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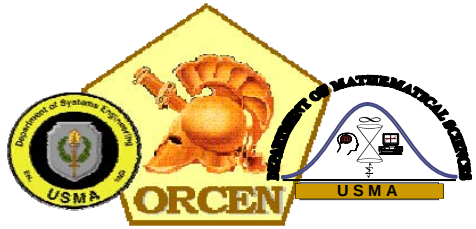
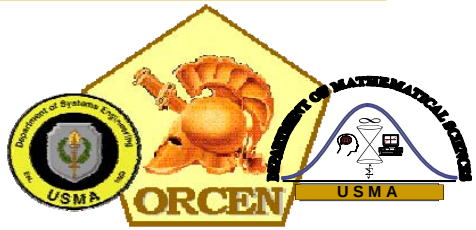
Modeling



- What to model
  - Not a set of specific, stand-alone alternatives
  - No unique alternatives
- Our approach
  - Individual items or fields of metadata
  - Allow individuals from the field to rate those items

Workshop Results

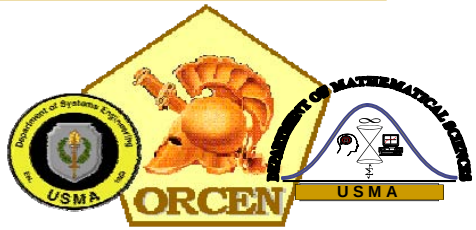


- Recommended some specific metadata
  - Discussed best way to format the metadata
    - Are roads included, Yes or No
    - Are buildings included, No / 2D / 3D
  - Those items were included in the 2nd questionnaire
- Recommended specific capabilities:
  - Allow a user to post opinions about a TDB
  - Email reflector

Questionnaire 2 (1 of 2)

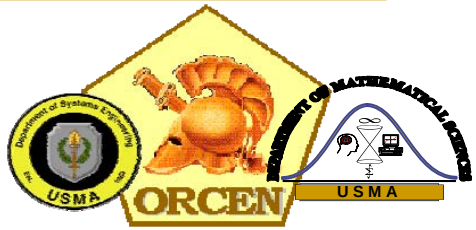
- Online questionnaire was distributed to ~55 individuals in the community
- Purpose:
  - Gather specific feedback about many alternative metadata fields
  - Gather feedback about additional capabilities
- Respondents were asked to classify themselves as TDB users, builders or managers
- Received 28 responses

Questionnaire 2 (2 of 2)



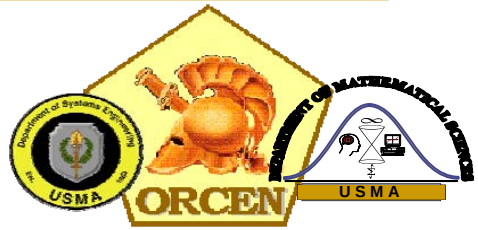
- Respondents were asked to rate 24 alternative fields
  - Required
  - Desired but not required
  - Not required
- No limit to how many could be rated as required
- Potential metadata fields were taken from a variety of sources
  - Recommendations from questionnaire 1 and workshop
  - Federal Geographic Data Committee standards (MEL)
  - Environmental Data Conversion Standards (EDCS)

Summary of Questionnaire 2 Results



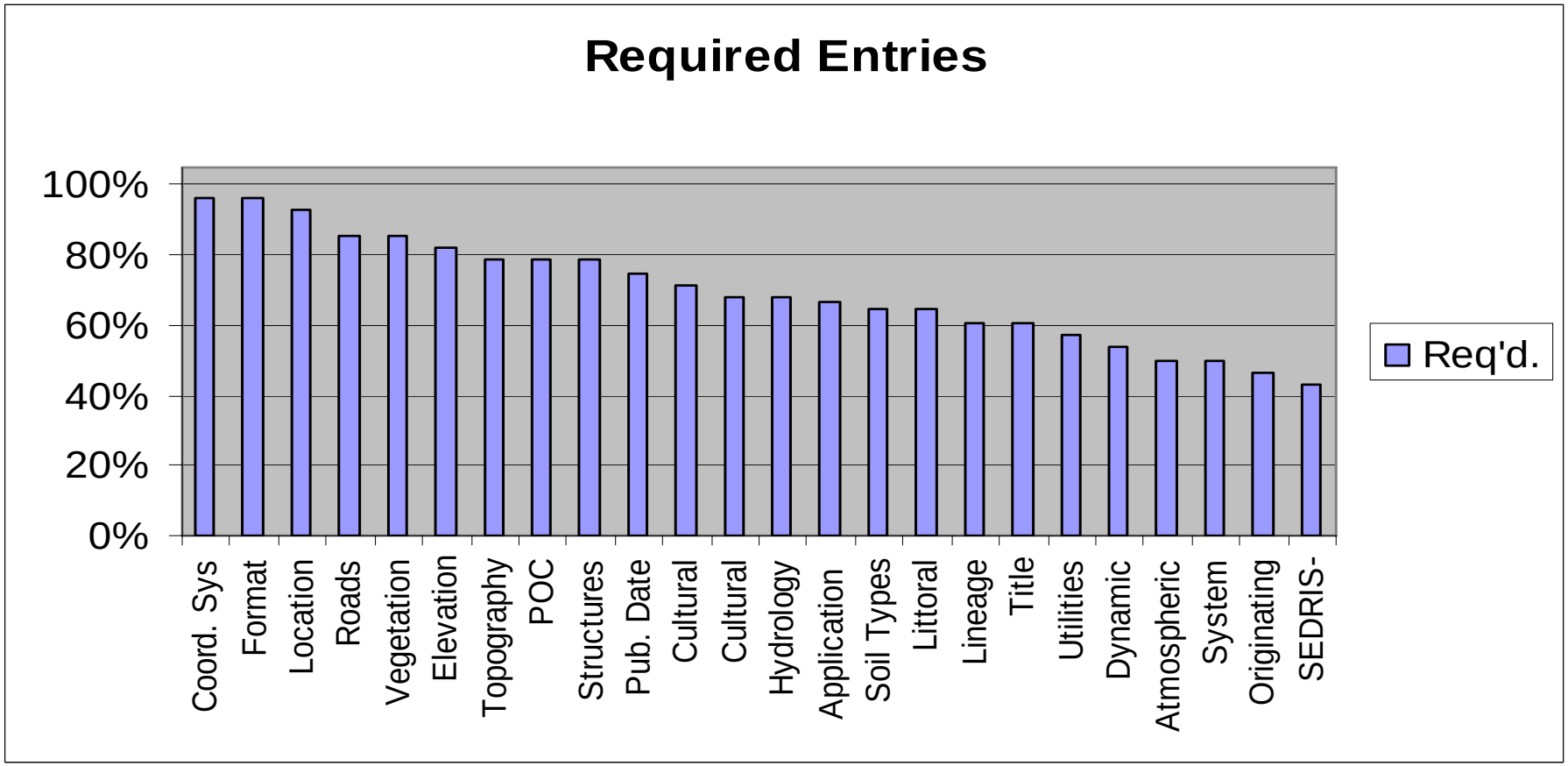
- Of 28 responses received
  - 6 builders
  - 4 managers
  - 7 users
  - 11 “other”
- On average, a respondent identified 17 (of 24) fields as required
- A person searching could search on any or all of the available fields
- Additional recommended capabilities
  - Email reflector
  - Update information about the TDB

Possible Fields

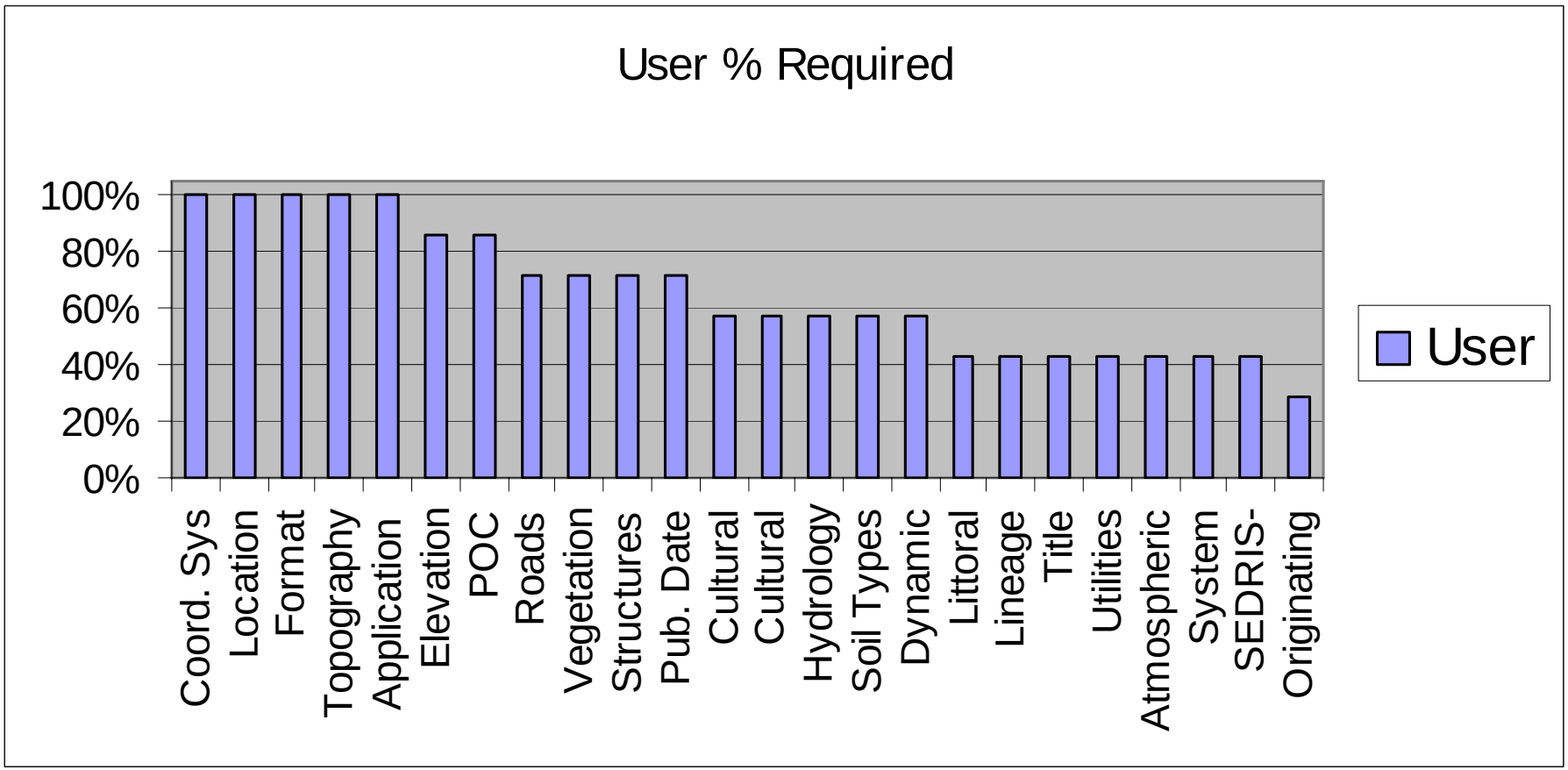


- Are structures represented
- Publication date
- Are cultural features represented
- Is hydrology represented
- Cultural source data
- Are soil types represented
- Are littoral features represented
- Lineage
- Title
- Are atmospheric effects represented
- SEDRIS-compliant
- Coordinate system
- Format
- Location
- Are roads represented
- Is vegetation represented
- Elevation source data
- Point of Contact
- Topography representation
- Application
- Are utilities represented
- Is dynamic terrain represented
- Originating agency
- System requirements

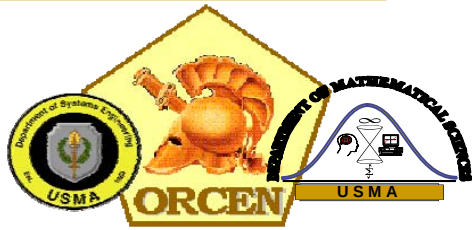
Required Responses (%) (All respondents)



Required Responses (%) (User)

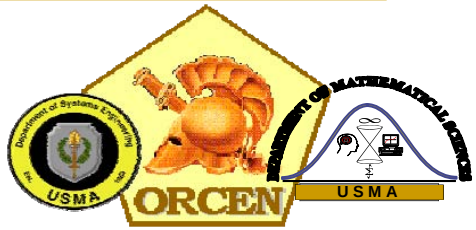


Scoring Method



- TDB User-focused
- Competing interests for number of fields
  - For searching, more is better (16 or more)
  - For posting, less is better (6 or less)
- Recommendation: 9 fields, based on
  - Input from users
  - Ability to reduce the number of TDBs returned

Recommendation (1 of 3)



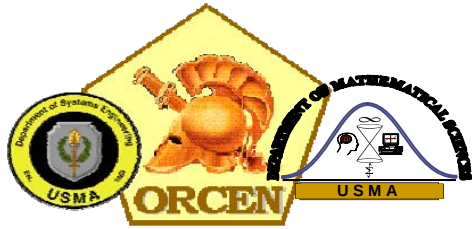
- Organize TDBs using two sections of metadata
  - Required entry when posted
  - Optional entry when posted
- Provide a mechanism for users/subscribers to post comments or information about a TDB
- Provide an email reflector to allow users/subscribers to post a question to the community

Recommendation (2 of 3)

9 Required entries (% of respondents rated required)

1. Coordinate system (96% *& all users*)
2. Format (96% *& all users*)
3. Location (93% *& all users*)
4. Are roads represented (86%)
5. Is vegetation represented (86%)
6. Elevation source data (82%)
7. Point of Contact (79% *& required for access*)
8. Topography representation (79% *& all users)*
9. Application (67% *& all users*)

Recommendation (3 of 3)

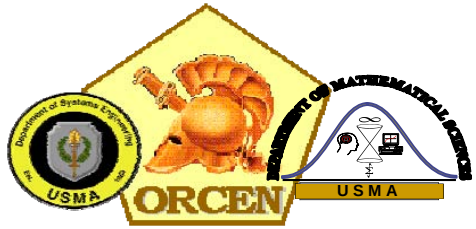


- 9 Optional entries (% of respondents rated required)

1. Are structures represented (79%)
2. Publication date (75%)
3. Are cultural features represented (71%)
4. Is hydrology represented (68%)
5. Cultural source data (68%)
6. Are soil types represented (64%)
7. Are littoral features represented (64%)
8. Lineage (61%)
9. Title (61%)

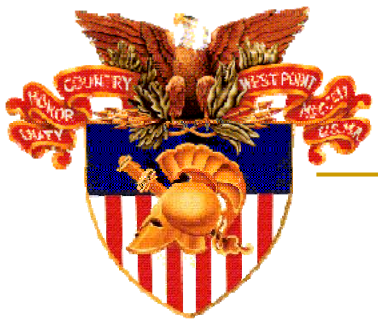
> 60% of respondents rated as required

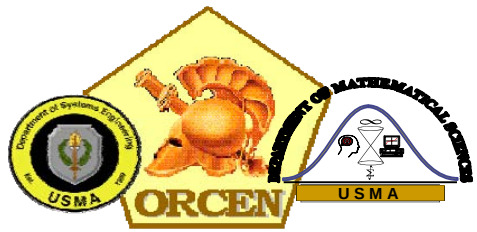
Conclusions



- Army Digital Terrain Library can perform a useful function for the M&S community
- The key to its use and acceptance is a meaningful yet concise set of metadata
- Next steps
  - Place ADTL in accessible location
  - Populate and manage

Questions and Discussion





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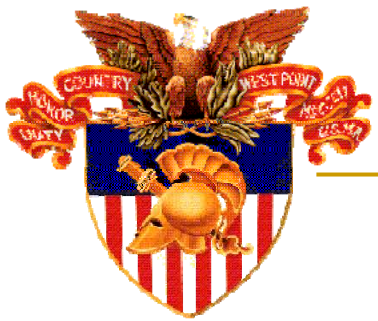
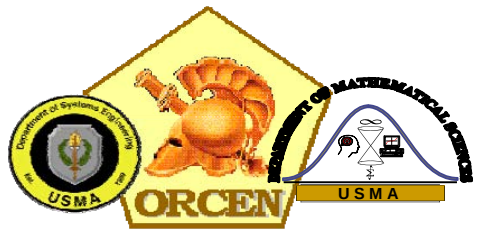
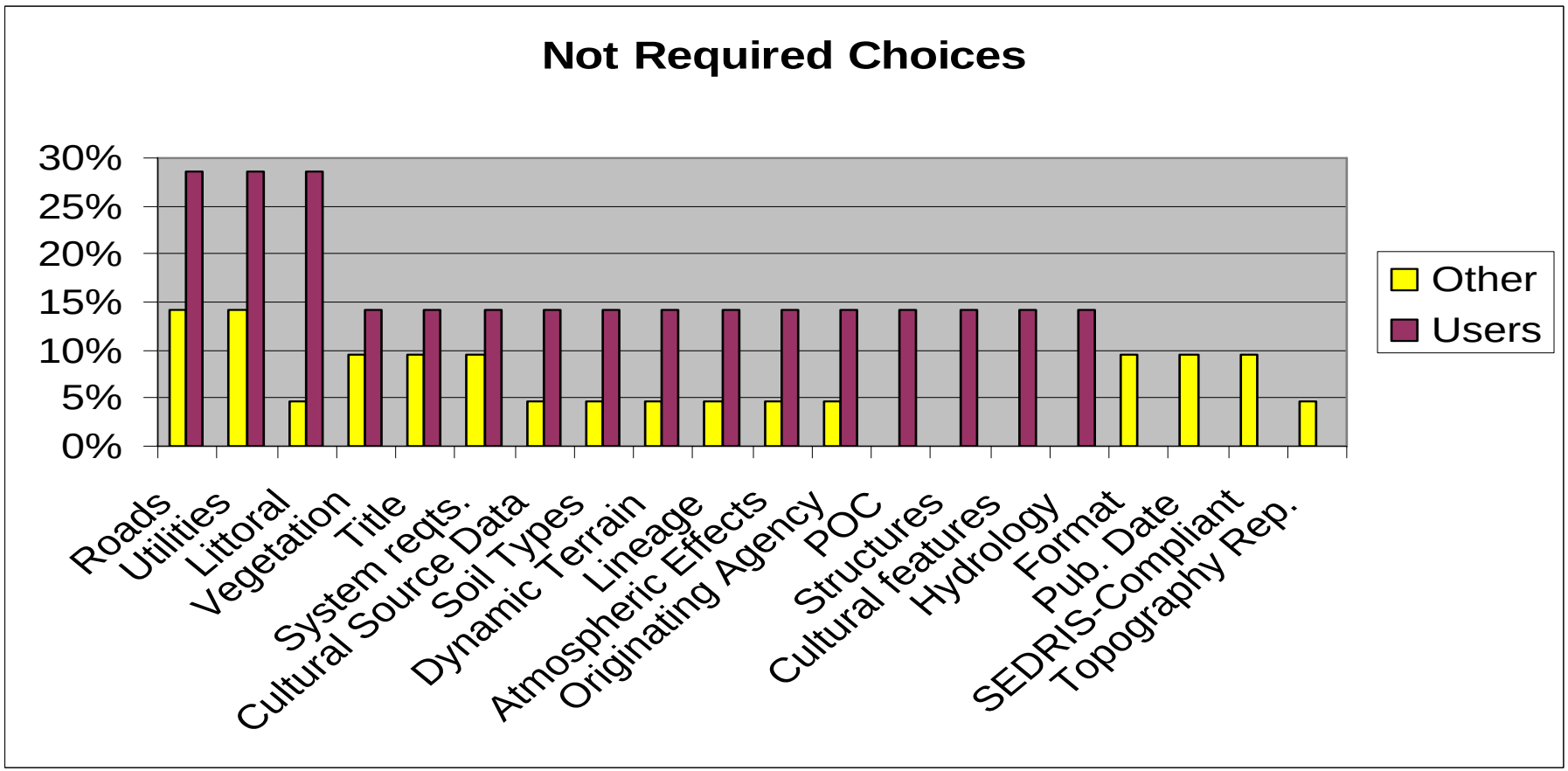
End of presentation

Backup Slides

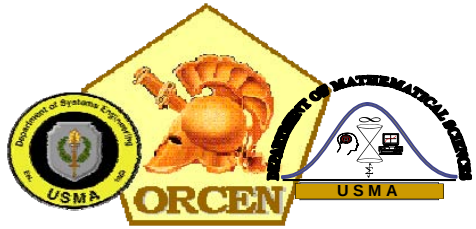




Not Required Entries

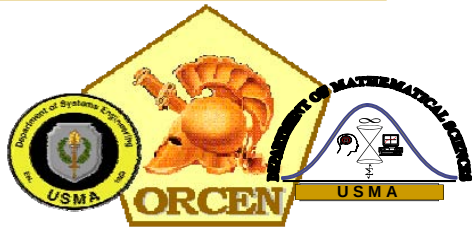


Workshop



- 10 attendees, held in conjunction with IITSEC
- Purpose:
  - Present initial findings to the community
  - In small groups, discuss the characteristics of TDBs that should be considered
  - Capture other possible feedback for the project

Potential Additional Steps



- Use this framework in the ADTL
- Integrate these efforts with the J-GES development
- Collaborate with PEO STRI to use SVDR as an example
- Expand the requirement to include battle command databases